EX PARTE OR LATE FILED

ORIGINAL

RECEIVED

NOV 22 1993

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

LAW OFFICES
GOLDBERG, GODLES, WIENER & WRIGHT
1229 NINETEENTH STREET, N.W.
WASHINGTON, D.C. 20036

(202) 429-4900
TELECOPIER:
(202) 429-4912

HENRY GOLDBERG
JOSEPH A. GODLES
JONATHAN L. WIENER
HENRIETTA WRIGHT
MARY J. DENT
DANIEL S. GOLDBERG*

THOMAS G. GHERARDI, P.C.
COUNSEL

*NOT ADMITTED IN D.C.

DOCKET FILE COPY ORIGINAL

November 22, 1993

BY HAND

Mr. William F. Caton, Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Re: PR Docket No. 92-257

Dear Mr. Secretary:

On October, 12, 1993, BR Communications requested special temporary developmental authority pursuant to Parts 80 and 87 of the Commission's Rules to test its "Chirpsounder®" technology for commercial maritime and aviation applications ("BR's Application").[1] BR now requests that the Commission, as part of its current effort to modify and update its maritime rules, amend its maritime and aviation rules (47 C.F.R. Parts 80 and 87) as necessary to permit regular operation of high frequency ("HF") sounder systems, such as BR's Chirpsounder system, and their ancillary communications systems, such as BR's Chirpcomm system. See Notice of Proposed Rulemaking and Notice of Inquiry, PR Docket 92-257, 7 FCC Rcd. 7863 (rel. Nov. 30, 1992) ("NOI").

As discussed in greater detail in BR's Application, existing HF communications systems are inadequate or unfeasible for many applications

[1] As described in the Application, BR's sounder system would consist of a modest network of low power, linear FMCW ionospheric Chirpsounder transmitters, whose primary purpose would be to maximize the usefulness of the HF spectrum for communications by civil aircraft and ships transiting the Atlantic and Pacific Oceans. Approximately 12 sounder transmitters would be placed at or near HF communications entry points serving ships on the high seas and aircraft. (The use of existing Chirpsounder transmitters would minimize the need to install additional transmitters.) The transmitters typically would be operated by the HF communications maritime service providers or the airline service providers at these entry points. The transmitting start times would be published, and anyone owning a suitable receiver would know the precise propagation conditions into the entry-points.

No. of Copies rec'd 0+4
List ABCDE

due to the inherent variability in ionospheric propagation. BR's Chirpsounder system dramatically improves the performance of HF communications systems by enabling users to select a specific operating frequency within the current overall propagating bandwidth that will provide an acceptable received signal-to-noise ratio. With the Chirpsounder system, the connectivity and reliability of HF data links can be improved dramatically, as proven in many years of use in government and military communications networks.

BR's Chirpsounder system also incorporates sub-carrier modulation of the sounder signal (Chirpcomm®), which permits brief "order-wire" or emergency messages to be passed when all other fixed-frequency HF transmission techniques fail. Chirpcomm is a powerful HF spread-spectrum communications system that incorporates extensive error correction and data redundancy to assure highly reliable reception of 40 character messages.[2] Chirpcomm overcomes the inherent uncertainty in knowing which frequencies are propagating by using all frequencies.

For the past 25 years, ionospheric sounders covering the 2 - 30 MHz HF band have been used by government and military communications commands in the U.S. and other countries to maximize the usefulness of their HF radio systems and to support the highest priority HF communications.[3] The majority of these sounders use linear frequency modulated continuous wave ("FMCW") "Chirp" modulation technology;[4] essentially all of the linear FMCW sounder systems operating in the world today have been developed, manufactured, installed, and supported by BR.

Chirpsounder and Chirpcomm are designed to minimize interference to other HF spectrum users by using a very narrow instantaneous bandwidth (a few Hz) and by operating at a very low peak power (a few watts). The modulation consists of a linear FMCW sweep, moving at a 100 kHz/second

---

[2] The 40-character message consists of a 2-character "station identifier" ("Transmit ID") plus a 38-character text message. The 2-character Transmit ID provides a simple, automatic and accurate method to identify each Chirpsounder transmitter uniquely. All Chirpcomm-equipped transmitters normally transmit the Transmit ID even when no Chirpcomm order-wire or emergency message traffic is being transmitted. The Transmit ID provides positive identification of each transmitter and ensures that the ship or aircraft communicator is receiving the desired Chirpsounder transmitter.

[3] Major military communications commands in the U.S., U.K., France, Italy, Spain, Scandinavia, Australia, New Zealand, Japan, Taiwan, Saudi Arabia, and other countries currently use BR's sounding technology for their HF radio communications systems.

[4] The "chirp" wave form consists of a CW signal that is linearly frequency modulated to produce a linear frequency sweep. This is a well-known wave form that has been used in pulse compression radar systems for many years.

sweep rate, generally covering the 2 to 30 MHz band. The sweep lasts 4 minutes and 40 seconds and is typically transmitted 2 to 4 times per hour. Chirp transmissions on key time-standard and safety frequencies are "blanked out."[5] The frequency sweep is generated by digital synthesis in one Hz steps. Transmitted power is generally in the range of 1 to 100 watts, most commonly 10 watts. The sweep occupies a conventional fixed-frequency HF communications channel for 30 milliseconds (the time required for the sweep to pass through a 3 kHz bandwidth).

There is no modern HF modulation or service that is adversely affected by the energy created by low power FMCW sweeps, as evidenced by the fact that, although the Chirpsounder modulation has been in use since 1966 in military applications and there are currently nearly 150 Chirpsounder transmitters deployed around the world, there have been no interference complaints regarding the system BR proposes to operate.[6]

As discussed in greater detail in BR's Application, deployment of the BR Communications system would improve the quality, reliability, and ease of use of maritime HF services, thereby enabling more circuit choices (*i.e.*, HF vs. satellite) to be made on economic grounds and lowering the costs incurred by maritime operators, as well as improving the operating safety of the ships. Moreover, the Chirpsounder system would improve aircraft reporting and control over oceans, enabling airlines to fly more efficient routes and improving the safety of over-water travel.

Finally, because use of the Chirpcomm system dramatically increases the first-time connectivity rate for HF transmissions, often effectively doubles the available bandwidth, and improves the signal-to-noise ratio such that most messages can be transmitted on a single attempt, its use would increase the efficiency and usefulness of the HF spectrum, thereby promoting the public interest in efficient spectrum use.

For the foregoing reasons, the Commission, as part of its effort to modify and update its maritime rules in the pending NOI, should modify its existing maritime and aviation rules as necessary to permit regular operation of HF sounder systems, such as BR's Chirpsounder system, and their ancillary communications systems, such as BR's Chirpcomm system. Specifically, BR

---

[5] See page three of the Attachment for a list of "blanked out" frequencies.

[6] On one occasion, there was a complaint of interference caused by a transmitter with an EIRP of approximately 600 watts sweeping twelve times per hour. Both this EIRP and this sweep rate significantly exceed BR's proposed levels. BR is unaware of any other complaints of interference, even in crowded HF environments such as the United Kingdom, where the U.K. military has been operating several 10-watt transmitters continuously for over 10 years.

believes that the changes discussed in the Attachment to this letter are necessary and appropriate to achieve this important objective.

Sincerely,

Henry Goldberg
Mary J. Dent
Attorneys for
BR Communications

cc: Robert H. McNamara
George R. Dillon

BR COMMUNICATIONS:
PROPOSED RULE MODIFICATIONS

Frequencies.[1] The Commission should authorize licensed HF sounder transmitting stations to transmit sounding, and ancillary communications, signals throughout the 2 - 30 MHz range, with the exception of the "blanked out" frequencies listed on page three below, notwithstanding any other restrictions contained in the Rules regarding the availability of, or permissible communications using, these frequencies, and without a requirement for frequency coordination. Such an authorization would be consistent with the federal government's existing use of these frequencies for this purpose.

Scope of Communications; Obligations of Public Coast Stations.[2] The Commission should authorize public coast stations, aeronautical en route stations, and other maritime and aviation land stations to transmit sounding, and ancillary communications, signals upon receipt of an appropriate license. In addition, it should relieve stations which are constructed and authorized solely for the purpose of transmitting sounding, and ancillary communications, signals from more general "common carrier" obligations, such the obligation to provide general communications services to ships and aircraft. This would permit the establishment, where appropriate, of limited-use HF sounding transmitting stations. Such stations would, of course, transmit sounding signals on a non-discriminatory basis.

Bandwidths.[3] The Commission should authorize transmissions of sounding signals with the specified characteristics, and should define or designate an appropriate class of emission:

Emission Designator	28MF1D
Authorized bandwidth	28.0 MHz[4]

Classes of Emission.[5] The Commission should authorize HF sounding transmitters to transmit periodically a linear FMCW sweep, at a 100 kHz per second average sweep rate, on a fixed and published schedule of authorized sweep start times. Sounding transmissions should occur at least two times per

---

1 E.g. 47 C.F.R. Part 2, Subpart B; Part 80, Subpart H; and Part 87, Subpart E.

2 E.g. 47 C.F.R. §§ 80.5, 80.106, 80.453, 80.503, 80.701, 87.5, 87.261.

3 47 C.F.R. §§ 80.205, 87.135, 87.137.

4 The 28 MHz total bandwidth is not continuously occupied, but is sampled over a 280-second period. Instantaneous bandwidth of the sounder does not exceed 500 Hz.

5 47 C.F.R. §§ 80.207, 87.131, 87.137.

hour and not more than four times per hour. Total sounded frequency range should be 2 to 30 MHz, and the sweep should be completed in 4 minutes and 40 seconds. The Rules should provide for mutual interference between sounder transmitters to be prevented by assigning different sweep start times and sweep formats to each transmitter, such that at any instant in time the instantaneous frequency of each transmitter is different.

Transmitter frequency tolerances.[6] HF sounding transmitters should be authorized to transmit a linear FMCW sweep initiated and generated by a digitally controlled programmer operating with a digital frequency synthesizer to generate a CW wave form that is linearly stepped in frequency. The instantaneous frequency accuracy and timing of the sweep should be directly controlled and uniquely determined by the programmer which advances the sweep frequency in one Hz increments. The frequency and step timing accuracy of the programmer should be better than 0.1 parts per million. The programmed start times of the sweep should be maintained to an accuracy better than ±0.1 seconds of Universal Coordinated Time.

Emission Limitations.[7] The Rules should provide that HF sounding sweep transmissions would not remain in any 3 kHz bandwidth in the 2 - 30 MHz range for more than 50 milliseconds. The instantaneous bandwidth of HF sounding transmitters should be no greater than: 10 Hz @ –3 dB, and 500 Hz @ –40 dB relative to the average FMCW carrier power. Transmitters sending ancillary communications modulated messages should occupy an average instantaneous bandwidth of no more than 600 Hz @ –25 dB. Transmitter spurs (both harmonic and non-harmonic) should not exceed 10 milliwatts EIRP within ±15 kHz of the FMCW carrier, should not exceed 1.0 milliwatt EIRP below 30 MHz, 0.1 milliwatts EIRP above 30 MHz and 1 microwatt EIRP above 100 MHz. Transmitter phase noise should be less than 10 microwatts EIRP measured in a 100 Hz bandwidth at frequency offsets greater than 1 kHz from the FMCW carrier, dropping to less than 1 microwatt at offsets greater than 100 kHz from the carrier. HF sounding transmitters automatically should blank out emissions on all frequencies within ±6 kHz of the frequencies listed in the table below. Blanking should attenuate the transmitter output such that any residual signal emanating from the HF sounding transmitter on these protected frequencies would be less than 10 microwatts EIRP.

---

[6] 47 C.F.R. §§ 80.209, 87.133.

[7] 47 C.F.R. §§ 80.211, 87.139.

Protected frequencies (kHz):

2091.0	2174.5	2182.0	2187.5	2500.0	3023.0
4000.0	4125.0	4177.5	4188.0	4207.5	5000.0
5680.0	6215.5	6268.0	6282.0	6312.0	8257.0
8357.5	8364.0	8375.0	8376.5	8414.5	
10000.0	12392.0	12520.0	12563.0	12577.0	
15000.0	16000.0	16522.0	16695.0	16750.0	
16804.5	20000.0	25000.0	27524.0		

Modulation requirements.[8] The Rules should provide that HF sounding transmitters operating in the 2 - 30 MHz range would generate an FMCW wave form synthesized in 1 Hz steps at a 100 kHz per second sweep rate, with a positive slope starting at 2.0 MHz and ending at 30.0 MHz. FMCW modulation sidebands would be greater than 30 dB down within a range of frequencies 10 to 500 Hz offset from the carrier. Ancillary communications modulation superimposed on the HF sounding FMCW carrier would operate at 55 bits per second synchronous data rate using a 250 Hz separation, 2-tone modulation. All HF sounding transmitters should be authorized to transmit a 2-character ID uniquely assigned to each authorized HF sounding station.

Transmitter power.[9] The Rules should provide that HF sounding transmitters operating in the 2 - 30 MHz range would typically operate at 10 watts average transmitter output power. If operating conditions such as distance, antenna types or propagation requires greater transmit power to achieve adequate signal to noise at the intended HF sounding receiver, the transmitter output power could be increased to a maximum of 100 watts, but would not exceed 100 watts EIRP. The peak envelope power of a HF sounding or ancillary communications transmitter would be within 3 dB above the average power.

---

[8] 47 C.F.R. §§ 80.213, 87.141.

[9] 47 C.F.R. §§ 80.215, 87.131.